



# Performance you can see

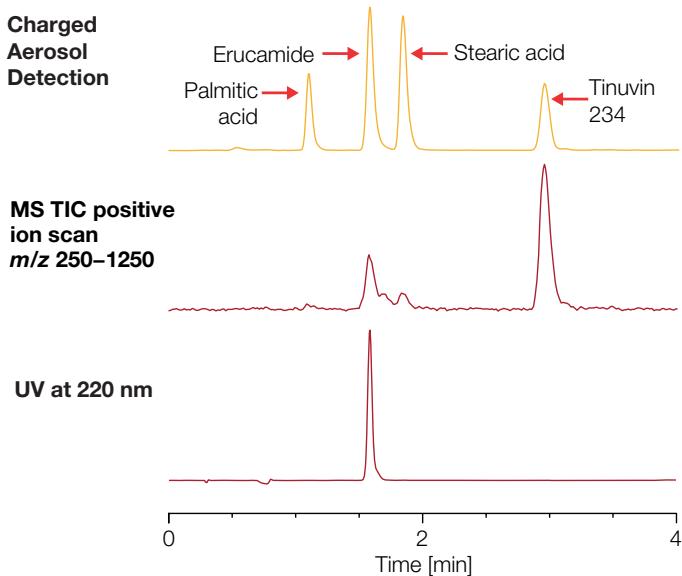
Meet the Thermo Scientific™ Vanquish™  
Charged Aerosol Detector P Series

thermo scientific

# Confidence in your analysis

No single liquid chromatography (LC) detector delivers perfect results. Often, one analyte class responds more strongly than another or may not respond at all. That is why you need an instrument with near-universal detection to help overcome your challenges, and the charged aerosol detector (CAD) is an ideal solution. With a consistent response that enables accurate quantitation, the CAD is a reliable technology that will give you confidence in your analysis.

The Thermo Scientific™ Vanquish™ Charged Aerosol Detector P Series can detect all non-volatile, and many semi-volatile analytes, with a uniform response. Its versatility makes the CAD useful for the analysis of pharmaceuticals, biomolecules, foods and beverages, specialty chemicals, and polymers—to name a few. It provides you with the accuracy needed for R&D and the reproducibility required for manufacturing QA/QC. With your CAD, every sample is analyzed with confidence and clarity.



**Figure 1.** The near-universal detection capability of the CAD.

Unlike mass spectrometry (MS) and UV, the CAD can measure all analytes in a sample (Figure 1). MS requires the analyte to form gas phase ions, while response by a UV detector depends upon the presence of a chromophore.



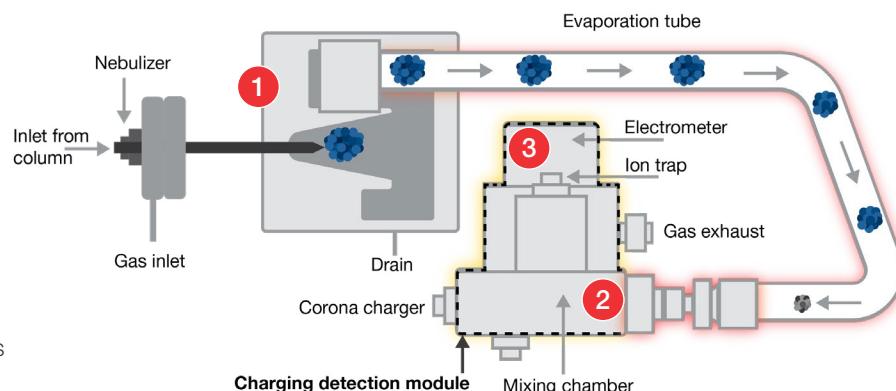
**Figure 2.** CAD response (0.5 µg) by flow injection analysis.

Its exceptionally consistent uniform response allows for the quantification of multiple analytes using a single calibrant—ideal for determining unknown impurity levels when standards are unavailable or cost-prohibitive. Figure 2 shows a wide range of compounds differing in their physicochemical properties but the relative response deviation is just 7.2% for all 22 non-volatile analytes.

# Easy as 1...2...3

## 1 Nebulization

The eluent is nebulized into droplets, which are subsequently heated and then dried into particles. The particle size increases with the amount of analyte.

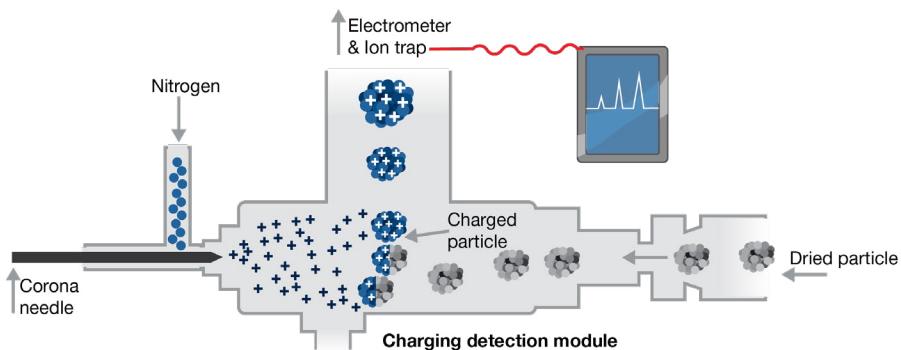


## 2 Charging

A stream of charged nitrogen gas collides with the analyte particles, producing positively charged analyte particles.

## 3 Detection

The charged particles are measured by an electrometer. The signal is directly proportional to the quantity of analyte present.



Learn more about how the CAD works  
[thermofisher.com/CAD](http://thermofisher.com/CAD)

## Gain confidence



### Up to 10x more sensitive than other near-universal detectors

With a linear response up to two orders of magnitude and a dynamic range up to four orders of magnitude, the CAD is inherently more sensitive than the refractive index (RI) and evaporative light scattering (ELS) detectors.



### Measures particle charge, not mass or optical activity

The CAD measures particle charge, and the signal is directly proportional to the quantity of analyte in your sample.



### Compatible with gradient elution

Unlike RI detection, the CAD is compatible with gradient elution allowing for better separation, faster analysis, and improved peak resolution.

# Designed for efficient method setup



## 1 Diverter valve

Increase robustness by preventing detector contamination and improving peak integration by diverting the matrix to waste.

## 2 Nebulizer

The individually certified FocusJet concentric nebulizer ensures compatibility with analytical HPLC, UHPLC, and microflow LC without modifying hardware.

## 3 Temperature control

Advanced evaporation temperature control combined with temperature coupling mode during particle charging and detection increases reproducibility and method flexibility.

## 4 Acquisition

Acquire four channels at different power values, ensuring method development and method transfer are effortless.

**The Vanquish Charged Aerosol Detector P Series opens new opportunities for discovery and routine analysis**



Utilize the CAD with the wide application flexibility and reliability of the Thermo Scientific™ Vanquish™ HPLC and UHPLC Systems for a worry-free, integrated chromatographic system.

[See our Vanquish CAD P series catalog today](#)



With our external configuration kits, you can add a CAD to any liquid chromatography system from any manufacturer. The Thermo Scientific™ Vanquish™ User Interface (UI) allows you to set and check detector parameters while providing step-by-step maintenance videos and multi-language support. All UI features are available independent of external software or PC connection.

# Supports compliant workflows

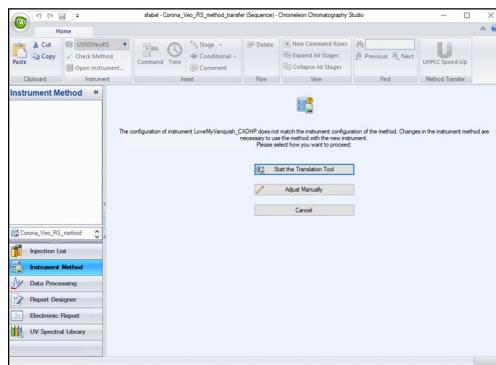
Maximize the full capabilities of your charged aerosol detector with Thermo Scientific™ Chromleon™ Chromatography Data System (CDS).

## Adhere to strict regulatory guidelines

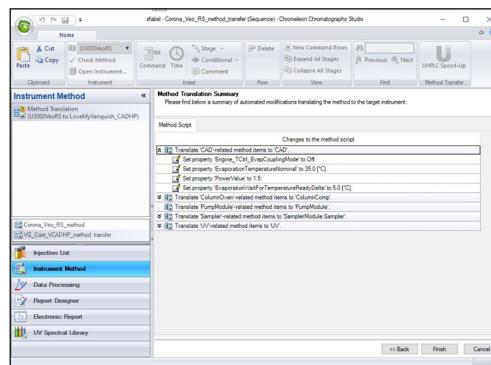
Built-in tools support 21 CFR Part 11 and GxP compliance, ensuring data integrity and audit readiness.

## Effortless method transfer

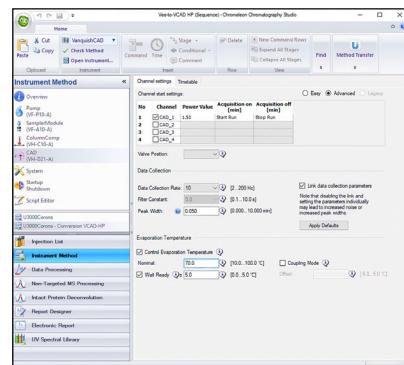
The method translation tool ensures seamless method transfer from previous CAD models with familiar method settings, providing a consistent user experience.



Step 1: Start method translation



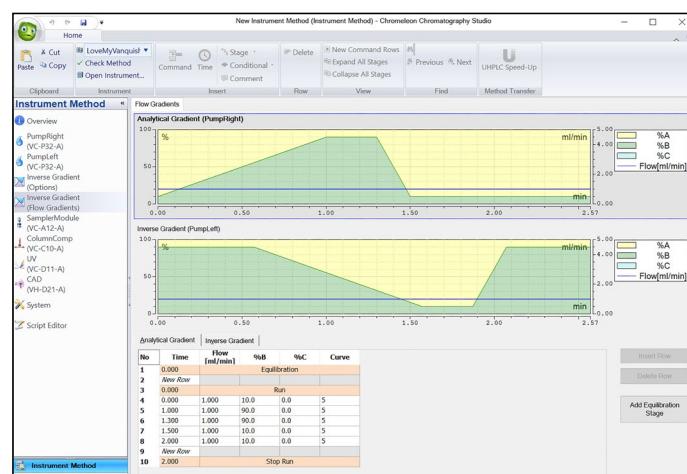
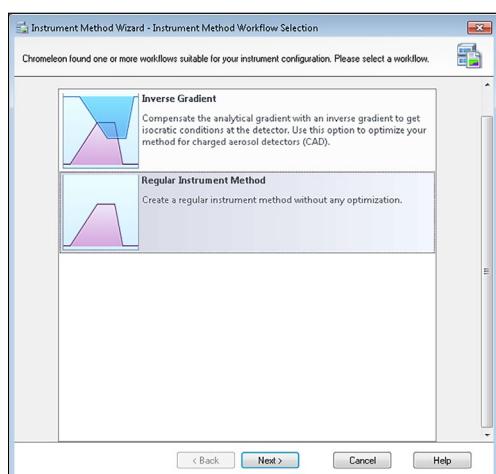
Step 2: Method translation summary



Step 3: Ready to run

## Streamline your workflow with ease

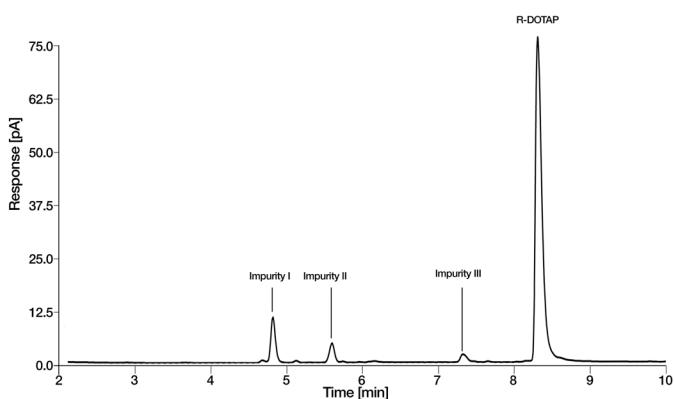
Effortlessly apply an inverse gradient to maintain a consistent response with a built-in wizard that automatically calculates any associated method parameters by taking all system volumes into account.



# Applications

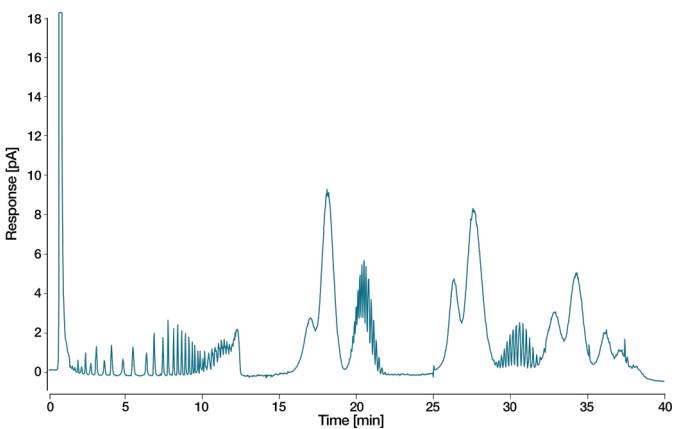
## Lipid nanoparticles

Charged aerosol detection is recognized in the latest USP guidelines for mRNA analysis, offering precise and reliable detection for lipid nanoparticles (LNPs). Learn more about the application of analysis of cationic lipids in [AB003866](#).



## Polysorbate 80

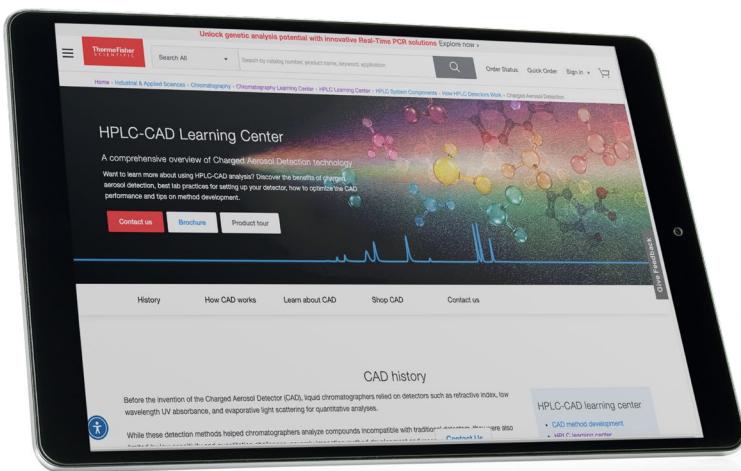
Charged aerosol detection offers precise quantitation of polysorbates in biopharma formulations, ensuring accurate quality control and consistency in drug development. Characterization of PS80 formulation by group-based quantitation is used for lot-to-lot comparisons to identify any variation. Learn more about this approach and time-saving method optimization tools in [AN003506](#).



## A staple for compendial analysis

Charged aerosol detection is an essential tool for compendial analysis, meeting the rigorous standards set by ASTM International, CP, EP, ISO, and USP. Its ability to provide reliable, reproducible results ensures compliance with global pharmacopoeia and regulatory guidelines, making it indispensable in pharmaceutical testing.

[View a list of compendial methods](#)



## Proven technology, trusted worldwide

With over 1,400 publications currently available and over 240 new ones published each year, charged aerosol detection is a well-established technique used across pharma, biopharma, food safety, environmental analysis, and more. Explore the extensive research and see how this technology can support your work.

[Visit our CAD publications library](#)

# Get versatility that lets you move faster

Acquire data from multiple detectors without replumbing your system and evaluate several detection parameters at once for faster method development.

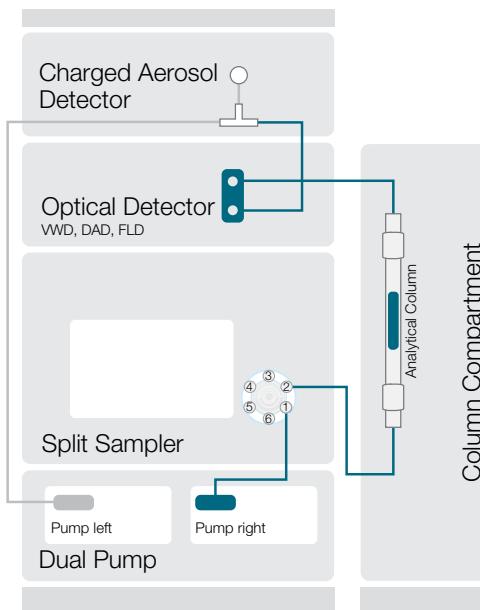
## Improve your quantitation without limitation

- CAD response for non-volatiles is independent of chemical structure but does depend upon mobile phase composition
- Changing organic solvent composition over a gradient elution will change the analyte response
- CAD with an inverse gradient approach results in uniform response, allowing for single-calibrant quantitation

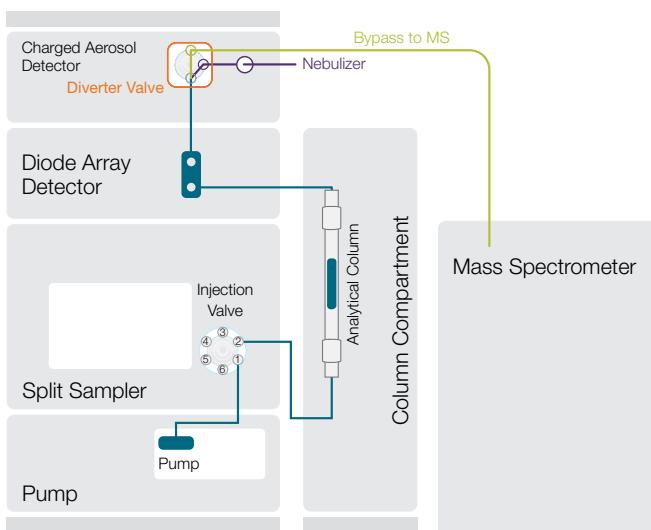
## Benefits of applying an inverse gradient

- Confident uniform response with gradient elution using dual pump technology
- Reliable single-calibrant quantitation of knowns and unknowns, independent of gradient composition
- Simplified method setup with automatic inverse gradient calculation considering all system volumes when using Thermo Scientific™ Vanquish™ Inverse Gradient LC Systems with Chromeleon CDS software

[Learn more about how to set up an inverse gradient](#)



**Figure 3.** Inverse gradient setup using dual pump technology for single-calibrant quantitation even for gradient separations.



**Figure 4.** With the integrated diverter valve, you can use either the CAD or MS without replumbing. Simultaneous multi-detection setups of two destructive detectors is possible with flow splitting.

## Quantify and identify your unknowns

The seamless combination of complementary LC detectors in a single platform produces a powerful tool for the in-depth characterization of complex samples. UV detection extends the range of compounds measured by the CAD to include volatile compounds. Complementary MS detection is used to confirm compound identity or for tentative identification of unknowns.

Use the multi-detector platform for:

- Thorough analysis of complex drug formulations
- Rapid evaluation of compound purity
- Quantitation and identification of impurities, degradants and contaminants

## Learn more about charged aerosol detection

Want to explore the full potential of charged aerosol detection and how it can enhance your analysis?

Visit our [Learning Center](#) to access in-depth resources, expert insights, and practical information on how the CAD works and its applications in various industries.

Whether you're new to charged aerosol detection or looking to expand your knowledge, our comprehensive content will guide you every step of the way.

Pair your Vanquish CAD P Series with our award-winning instruments

- Thermo Scientific Vanquish Core HPLC Systems
- Thermo Scientific Vanquish Flex UHPLC Systems
- Thermo Scientific Vanquish Horizon UHPLC Systems

Learn more at [thermofisher.com/vanquish](http://thermofisher.com/vanquish)



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